

# **From Bench to Bedside: Research and Testing of Internet Resources and Connections in Community Hospital Libraries\***

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## **ABSTRACT**

*Access to information becomes more valuable with the continuing proliferation of medical knowledge and the increasing economic pressure being experienced by health care organizations. This is particularly so for community hospitals in rural or isolated areas, where the economic pressures are at least as great as in urban areas and where access to information is often inadequate. These conditions have implications for the quality of patient care and for economic viability. In response to this, the National Library of Medicine, the University of Washington, and seven community hospitals in five Pacific Northwest states have joined forces in a broad-scale technology diffusion project to facilitate the application of research work to clinical care. There are three components to the project: 1) a pilot connections component to extend Internet access to the community hospitals, 2) a research component to test the performance of a client/server model for network access to anatomical text and images, and 3) a clinical component to develop a registry of DNA diagnostic laboratories facilitating the provision of genetic information to clinicians. The pilot connections component is described and preliminary findings are reported.*

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## **INTRODUCTION**

The possibilities and benefits of connecting health care organizations electronically in the Pacific Northwest has been under discussion for a number of years by University of Washington (UW) faculty and health sciences librarians, and community health professionals. The characteristics of the physical landscape of this region -- the rugged terrain and the vast distances -- is still a barrier to communications and has inhibited the growth and development of the communications infrastructure in this part of the country.

While the landscape presents barriers in one sense, it has also fostered an interdependence among the health care organizations which makes good communications even more necessary. The UW School of Medicine, for example, serves as a regional medical school for the states of Washington, Alaska, Montana, and Idaho -- nearly one-quarter of the US land mass. In an obvious way, this links students and faculty, universities and clerkship sites, throughout the region. In this era of increasing competition and decreasing budgets, these key organizational links require underlying electronic links in order to function effectively and to realize the efficient use of resources for which they were meant.

The UW is one of eight Regional Medical Libraries in a network of nearly 4,000 health sciences libraries nationally [1]. The mission of this highly organized network is to facilitate access to health sciences information by health

professionals, regardless of location [2]. At the UW Regional Medical Library, with our mission in mind, we seized on the conditions and opportunities described above and proposed to the National Library of Medicine expanding our program to include a project to address these needs. The project was funded in October 1992 and will extend through April 1994. The project includes three components:

- 1) a research component led by Dr. James Brinkley, UW Dept. of Biological Structure, to test the performance of a client/server system for the retrieval and use of anatomical images in a networked environment;
- 2) a clinical component led by Dr. Roberta Pagon, UW Dept. of Pediatrics and Children's Hospital-Seattle, to develop a registry of DNA diagnostic laboratories to facilitate the provision of genetic information to clinicians; and, finally,
- 3) a pilot connections component to extend Internet access to community hospitals -- and to assess costs, uses, problems, and benefits -- led by Neil Rambo of the UW Regional Medical Library.

This paper will describe the connections component in detail and report preliminary findings.

## HOSPITAL CONNECTIONS

When we proposed this project in June 1992, we were aware of few research and teaching hospitals on the Internet; we knew of no community hospitals that were connected, let alone rural community hospitals. To start there, then, is in some ways not obvious. From the standpoint of technological sophistication and readiness, for example, we were almost surely starting at the "wrong" end. But, we chose to do so because technology is not the focus of this work. With the environmental pressures already described, one of our guiding hypotheses was that community hospitals were in need of, if not in readiness for, the benefits that could be realized from introducing wide area networking.

Another starting point for this work was that hospital librarians are in a unique position within their organizations to introduce an information technology for use not only by

them, but potentially by all areas of the hospital. Reasons for this belief include the strong service orientation of librarians; that librarians are typically not identified with skirmishes over turf; and, that librarians have a close understanding of their users' needs, giving them insight into the perceived and actual value of a technology to solve information problems, and how best to introduce it.

We proposed this project to raise questions in an area where the need to be great, the likelihood of resources otherwise being directed this way is small, and also to test the model of the hospital librarian as an agent of change. Our intent is to begin a broad-scale diffusion project that will result in the eventual availability and use of wide area networking among community hospitals.

This component is being carried out by the staff of the Regional Medical Library (RML) and the hospital librarians at the designated project sites, with assistance from other project site staff and from NorthWestNet -- the mid-level network service provider for the region.

The following library-related applications were envisioned:

- 1) Conducting normal library functions: searching NLM databases, routing interlibrary loan requests using the DOCLINE system (developed by NLM), updating a national journal holdings database at NLM.
- 2) Sending and receiving images of documents using the Ariel software (developed by the Research Libraries Group) as an adjunct to existing interlibrary loan practices. Many academic libraries are now using Ariel; as far as we know, this is the first use in hospital libraries.
- 3) Using electronic mail and other Internet resources.

Clinical and administrative applications will be encouraged and supported, also, bandwidth permitting. (See the "Type of Connection" subsection.)

## Site Selection

Seven community hospitals in five states were selected to participate, based primarily on the

presence of an interested librarian, high assurance of support from her/his administration, geographic distribution, and, where possible, demonstrated outreach activities or possibilities -- either by the hospital (to other facilities for administrative or patient care purposes) or by the hospital library (providing information services to other health professionals). The desire for outreach opportunities was an attempt to extend the reach of project funding; to help ensure that the effects of improved communications will reach beyond the individual institution. No requirements were made regarding the state of computer networking within the hospital.

The sites are:

Alaska Native Medical Center, Anchorage -- a 150 bed teaching hospital.

Kalispell Regional Medical Center, Kalispell, Montana -- a 109 bed hospital.

Merle West Medical Center, Klamath Falls, Oregon -- a 176 bed hospital.

Kootenai Medical Center, Coeur d'Alene, Idaho -- a 187 bed hospital.

Providence Medical Center, Everett, Washington -- a 191 bed hospital.

St. Peter Hospital, Olympia, Washington -- with 340 beds, is the largest hospital.

Shodair Children's Hospital, Helena, Montana -- is the smallest site in the project, with 65 beds.

### **Type of Connection and Costs**

An assessment of each site's computing and networking resources was conducted during the proposal stage. The assessment revealed that two of the seven sites -- Kootenai and St. Peter -- had well-developed distributed computer networks, and sufficient systems staff, to make them likely candidates for dedicated Internet connections. A third site -- Shodair -- demonstrated wide-spread support for a dedicated connection. After consulting with project site and NorthWestNet staff, these three sites were proposed for direct connectivity via leased 56 kbps data circuits, this type of connection permitting relatively high speed

network access by multiple, simultaneous users. The other four sites would be limited to dial access to a remote network host using a modem and an ordinary telephone line -- one telephone line per user session.

Method of connection, then, differentiated the project sites into two groups -- each with a distinct set of costs -- including money, time, and equipment -- and benefits. Not surprisingly, the higher the cost, the greater the benefit. However, an issue to be dealt with when introducing a new technology, as in this project, is how to measure the value of a benefit not previously received? And, how to compare the value of a benefit perhaps little understood or appreciated with one already being received? especially when only one can be afforded? These are some overriding issues of this project.

Costs for the dedicated connection sites include:

- 1) installation of the data circuit  
\$1,500
- 2) NorthWestNet connection service  
\$10,000
- 3) use charges for the data circuit  
\$190 - 600/month
- 4) NorthWestNet membership fee  
\$8,000 - 12,000/year

Project funds cover 1) and 2), which are one-time costs; 3) is a recurring cost which varies by location and is covered for the length of the project. The "connection service" includes the purchase, installation, configuration, and maintenance of a network router and a DSU/CSU on site.

At the time the project was proposed, the NorthWestNet membership fee structure for organizations other than educational and research institutions had not been completely set. The fee structure used at that time was based on an organization's total FTEs. The two smaller dedicated connection sites -- Kootenai and Shodair -- were assessed an \$8,000 annual membership, which represented a 20% discount from the standard rate of \$10,000 for that size of institution. The other dedicated site, St. Peter Hospital, was placed in a larger category and assessed \$12,000 -- again, a 20% discount from the standard rate for that category of \$15,000. Project funds partially cover the NorthWestNet membership fee for each of the three sites, for

one year only.

Membership benefits include Internet connectivity, technical and user services support, representation on NorthWestNet governing and advisory committees, and access to a regional version of the UWIN system -- the UW's campus-wide information system with access to UW Library holdings and the MEDLINE and ERIC databases.

Beyond this, the direct connection sites are responsible for any internal hardware and software costs necessary to connect.

In contrast, costs for the dial access sites include:

- 1) long distance charges for telephone line use, where applicable;
- 2) NorthWestNet membership fee  
\$2,500

Dial access service is not a standard offering of NorthWestNet and the membership fee for these sites was negotiated for the purposes of this pilot project. In addition to the benefits outlined above, the dial access membership fees covered six guest accounts -- in addition to the librarian's account -- on NorthWestNet's host system. Project funds cover the full membership fee for the four dial access sites. Each dial access site has been provided with a 14.4 kbps fax modem for use in the project.

Since dial access is not a standard NorthWestNet offering, there is no provision for toll free access. Of the four dial access sites, two have to dial long distance to connect to the NorthWestNet host. The other two can dial in to local hosts and remotely log in (TELNET) to the NorthWestNet host from there.

### **Preliminary Findings**

In November 1992, project librarians traveled to the UW for two days of orientation, planning, and training. Most of them had not used Internet resources and services. The training, by RML staff members, provided an introduction in the use of network utilities and basic network navigation skills. An array of resources and services were demonstrated and experimented with during the training.

For the training, and for a limited time after it, guest accounts on the UW network were provided to the project librarians. This enabled them to continue to explore the Internet once they returned home, dialing in to the UW network by long distance. This was to be a brief interim measure. It was a few months, however, before the UW guest accounts were phased out and NorthWestNet accounts were established in their place. An unfortunate result of delay during this formative period is that the project librarians became quite accustomed to the rich array of information resources provided to holders of UW accounts. The switch to the NorthWestNet accounts limited their access to a smaller set of these resources and was viewed unfavorably by them. Fortunately, the same mailer program (PINE, developed at the UW) and basically the same user interface was still available.

During this time the project librarians became active users of the Internet. The RML staff serves as the primary source of user support for the group. E-mail was encouraged as the means to deal with problems encountered. A general RML address was established, and a project librarians distribution list was created, to facilitate the one-to-one and one-to-many communications. This support service was heavily used during the initial months while a wide range of problems were encountered and dealt with -- terminal emulation problems, for example, were notable, when TELNETing to particular hosts; as were fine points of FTPing files, and managing LISTSERV subscriptions. In addition to responding to individual queries, the RML staff developed online tutorials, or electronic fact sheets, on some of the commonly encountered problems, and distributed them to the project librarians by e-mail.

From December 1992 to the time of writing -- seven months -- discussions took place among the dedicated connection sites, NorthWestNet, and the RML, regarding what had to be done before connections could be established at the three sites. Each site has presented a unique set of conditions and problems. Each site has also had issues of education, planning, budgeting, and authority to contend with.

Responses to the attempts to bring Internet connectivity to these sites have been quite

different. Although the administration is favorably inclined, the systems staff at one site evidently views this project as a threat to their authority, and as a threat to the security of the hospital's systems. The systems staff at another site are enthusiastic supporters and have gone so far as to retrofit the network hardware and software in one wing of the hospital to ensure compatibility with Internet network protocols. These responses seem to have much to do with idiosyncratic organizational characteristics and personalities.

### CONCLUSION

Since none of the dedicated connections are yet in place at the time of writing, the most significant phase of the project remains to be done. Once institution-wide access becomes available at the three dedicated access sites, the focus of the project will shift to what uses others at these community hospitals will make of networked resources, and what success the librarians have in introducing and promoting applications.

Based on the limited experience of this project, what we can say at this point is that the state of development of computer networking -- and the staff expertise that goes along with it -- within community hospitals is such that attempting to forge a dedicated link to the Internet opens up a range of problems. It is our impression that the technical questions, although in no sense trivial, are the least of the issues to be dealt with. More intractable are internal organizational issues -- such things as authority and "turf" issues, how systems planning and decision-making are conducted, how education of staff is received and handled, how flexible the budget is. These issues take a great deal of time to work out in light of any proposed change, especially when introducing a new technology that crosses many organizational lines.

Still, at this early point in the project it seems safe to say that different levels of Internet connectivity are appropriate to community hospitals at different stages of development in networking and distributed computing. Where development is mature and there is an adequate base of staff support, dedicated connections are probably appropriate -- that will be borne out in the remainder of this project. Where those conditions do not exist, it is our preliminary

conclusion that a dedicated connection is not practical and dial access is a more effective approach. It also serves as a low risk interim solution until sufficient interest and networking infrastructure justifies a dedicated connection. In order for dial access to be satisfactory, however -- even as an interim option -- we feel that it must be provided toll free. More network service providers are now offering attractive toll free dial access options to appeal to this entry level market. Given our experience, this is an appropriate response to real market conditions.

Hospitals are complex organizations that operate in an information intensive environment where communication is often critical. The power of wide-area networking is particularly evident when applied to small rural hospitals, which typically face tight budgets and distances that make travel to other hospitals or urban centers prohibitive for health professionals as well as their patients. Access to information and the ability to communicate through computer networking can help alleviate many of the chronic and debilitating problems faced by this vital link in the health care system.

### References

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